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sifted slacken lime, well mixed, and made thoroughly plastic, form an excellent coating for retorts: if made thicker, this mixture is an impenetrable luting, that is not liable to crack.

Dr. Black recommends a mixture of four parts sand, and one of clay, except where it is to be exposed to an intense heat, and in such situations to use six parts of sand to one of clay.

For *fire*-lute, Mr. Watt directs the use of porcelain clay from Cornwall (not pipe clay) to be pounded small, and mixed up to the consistence of thick paint, with a solution of two ounces of borax in a pint of hot water. For want of this peculiar kind of clay, slacked quick-lime, mixed up in the same manner, may be used. This may be kept ready mixed in a covered vessel. For *cold*-lute he directs to take equal parts by measure of the above clay and wheat flour, and to mix them to a proper consistence with cold water. This is more tenacious than his fire-lute, but does not keep so well.

A very excellent lute for many purposes may be made by beating up an egg, both the white and the yolk, with half its weight in quick-lime in powder. This lute is to be put upon a piece of linen, and applied as usual. It dries slowly, but becomes very compact, and acquires great hardness.

A mixture of martial pyrites and muriate of ammonia forms a good lute for stopping the cracks in iron utensils; but the following artificial compound is preferred, on account of the exact proportions of the ingredients being more easily ascertained. To two pounds of iron turnings or filings, add one ounce of sal ammoniac, and one ounce of flour sulphur; blend the mixture with water till the whole is of a proper consistence, and use it fresh. This lute is employed by engineers to stop the joints of steam engines, and other large machinery.*

Just as this sheet was going to press, I received a letter from an intelligent stranger, informing me that a mixture of salt and whiting, properly kneaded with water, makes a very hard and durable lute for many purposes, particularly for securing the joints of the apparatus which is employed for the production of carburetted hydrogen gas.

Of Dyers' Aqua-Fortis.—From the Same.

This article is used for dissolving tin, to form a mordant for fixing some of the most valuable colours on woollen clothes. In employing this acid, the dyers in the metropolis generally proceed thus: A carboy of aqua-fortis is measured out into a large earthen pan, with from one to two quarts of water for every gallon of the acid, and the whole is well mixed by stirring it with a strong wooden spatula.

Supposing single aqua-fortis be used, the quantity of water employed generally amounts to about one third of the whole; but as no fixed rule can be given, this is left to the discretion of the workman, who apportions the quantity according to the nature and strength of the acid he is using. When the aqua-fortis and water are thus united, a few handfuls of grained tin are thrown in, in such a manner as nearly to cover the whole of the bottom of the jar. An action immediately commences; and if the aqua-fortis be properly prepared, and the tin uniformly spread, the solution goes on regularly, and no more heat is generated than is necessary to keep up a proper action.

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* As accidents frequently happen in this country from the bleachers' furnaces cracking, it might be worthy of attention, to try whether this mode of luting would be found to answer to stop the crack.

If a froth appears upon the surface, the whole is well stirred with the spatula for a few seconds, as it is known that this frothing is frequently occasioned by the tin lying in heaps at the bottom of the vessel. When this tin is dissolved, more is thrown in, and stirred as before, as occasion requires. If the aqua-fortis be pure, it will now be necessary to add a portion either of common salt or salt-ammoniac to the mixture, which is given in such quantities, and at such intervals, as the appearances of those acids suggest. Here the discretion of the workman is the only guide ;—for in this, as in many other cases, practice instructs better than precept.

When rather more than half the usual quantity of tin is dissolved, the liquor begins to turn, as it is termed, that is, a portion of yellow oxide collects round the mass of tin at the bottom of the vessel, which when stirred gives a colour to the supernatant liquor. When the aqua-fortis is in a proper state, the colouring always commences at the *bottom* of the jar, which increases on the further addition of the tin till the whole liquor acquires the colour of rum, or rather of bright amber. If the aqua fortis be good, these appearances always take place :—if not, the tin may dissolve, but the liquor as it becomes saturated, will acquire a milky, instead of a yellow, appearance ; which shows that the tin is improperly oxidized by the acid, and that such aqua-fortis is totally unfit for use.

It has been doubted whether solution of tin can be made by means of a pure nitric acid ;—and this much is certain, that the tin will remain only a short time in solution, unless a portion of muriatic acid be also present. The mordant, therefore, that the dyers use for scarlets, is a proper nitromuriate of tin. In order to produce this, that is, to convert the nitric to the nitric-muriatic acid, it is that common salt or sal-ammoniac is employed ; for either of these salts becomes decomposed by the aqua fortis, and their muriatic acid, thus liberated, performs its part in composing the solution.

Aqua-fortis is employed in a variety of trades, such as brass founderies, silver refiners, gilders, leather dyers, and calico printers ; but such aqua-fortis would be very improper for dyeing woollen cloths. Nothing can be better known to the dyers at large, than that the majority of the aqua fortis that is manufactured is entirely unfit for dyeing scarlet. Few are there of this occupation, who have not occasionally met with an article of this kind :—and whenever this happens, they know of no remedy but that of exposing it to the atmosphere to absorb oxygen, or laying by for nine or twelve months, to acquire age, as they term it.

Formerly, the difficulty of making good dyers' aqua-fortis was so great, that the whole which was consumed in these kingdoms was actually imported from Holland, and there are people now living who remember the time when they never thought of using any but Dutch aqua fortis. Owing, however, to various causes, the English dyers are now generally supplied from London, or by some particular manufacturies in the country who have paid a peculiar attention to the production of this distinct article. But even now, there is so much uncertainty in it, that many large dyers never use any aqua-fortis till it has lain in their warehouses for twelve months, that the component particles of the acid may unite more intimately, and thereby form that mild kind of aqua-fortis which readily dissolve tin, without rendering any part of it insoluble oxide.

Often reflecting on the inconveniences thus resulting to the dyers; also, on the loss of interest upon a large capital thus lying dormant; and on the disappointments often arising from the use of an improper article, I instituted a series of experiments on nitrous acid, in the hope of removing those difficulties; and it is only since the publication of the second edition of the Chemical Catechism that I was enabled to discover that *if aqua-fortis be distilled in a peculiar way, it is as fit for the use of the dyer in twelve days, as it is after being kept twelve months.* The knowledge of this fact is the reward of some thousand experiments, attended with considerable expense, and of several years patient investigation.

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